

Toxic Hot Spot – TMDL Study Submarine Base San Diego

DRAFT Phase I Sampling and Analysis Plan

18 November 2003



Presentation Outline

- Study Background – Alan Monji
- Submarine Base San Diego
- Conceptual Approach
- Historical Data
- Proposed Technical Approach
- Phase I Schedule
- Questions and Comments

Submarine Base San Diego

Site History

- 1852 US Army Ft. Rosecrans
- 1959 US Navy Submarine Support Facility
- 1961 Construction of facilities and piers
- 1974 Designated as shore command with 6 tenant commands
- 1981 Designated Naval Submarine Base
- 1998 Regionalization into Naval Base Point Loma

Submarine Base San Diego

Current Status

- Active Subbase area ~30 shoreside acres
- 7 submarines, submarine tender, and dry dock
- Waterfront and industrial operations including:
 - Loading/unloading supplies to ships and drydock
 - general ship maintenance and repair
 - transfer systems for potable water, sanitary wastes, and bilge oily water treatment

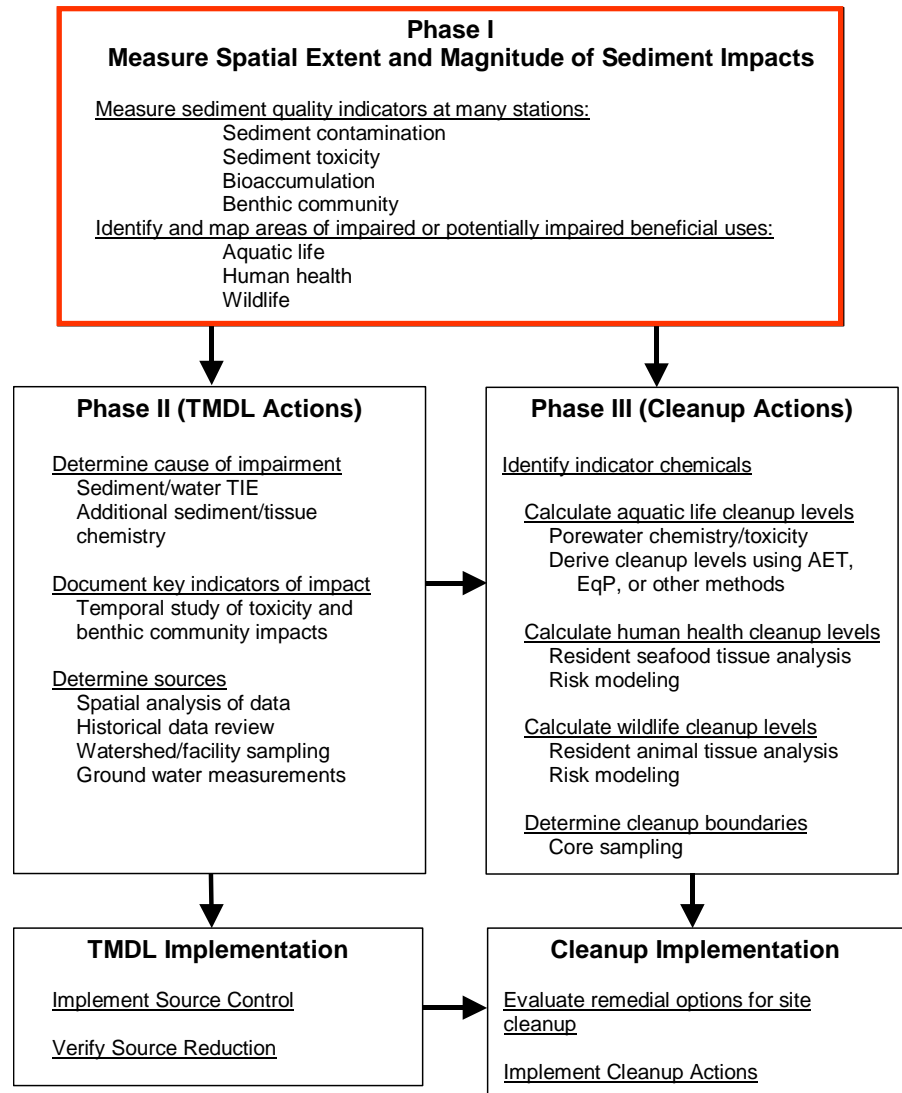


Conceptual Approach

- Follow RWQCB guidelines used in development of previous studies
 - Chollas/Paleta THS/TMDL
 - Shipyards
 - Switzer/Broadway Pier THS/TMDL
- Historical Review to determine Contaminants of Potential Concern (CoPC)
 - Parameters measured
 - Spatial extent
 - Data Gaps
- Technical Approach (Phase I)
 - Site specific study with comparisons to reference sites
 - Triad approach - chemistry, toxicity, benthic community
 - Ecological and human health screening

Program Elements

- Phase I: Magnitude and extent of impairment
- Phase II: TMDL source characterization
- Phase III: Clean up levels and boundaries
- Implementation: Source control and remedial options



Historical Review

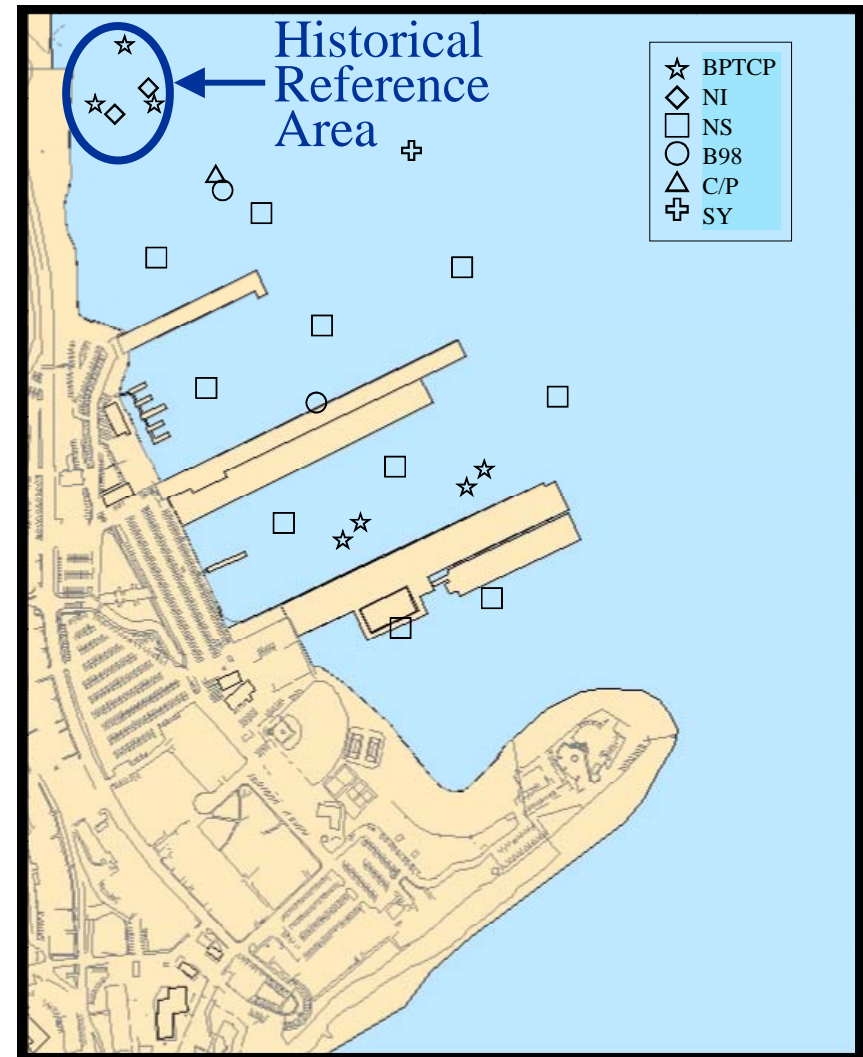
- Compiled data from recent studies (<10 years)
- All stations in or near identified THS strata
- Six studies with a total of 24 stations

Study	Date	N	Parameters
BPTCP	1993	7	Chem, Tox, BCA
North Island Site 1	1996	2	Chem, Tox, Bioaccum
Navy Screening Study	1997	10	Chem
Bight 98	1998	2	Chem, Tox, BCA
Chollas/Paleta TMDL	2001	1	Chem, Tox, BCA, Bioaccum
NASSCO/SW Shipyard	2001	1	Chem, Tox, BCA, Bioaccum
NASSCO/SW Shipyard	2002	1	Chem

BCA= Benthic Community Analysis

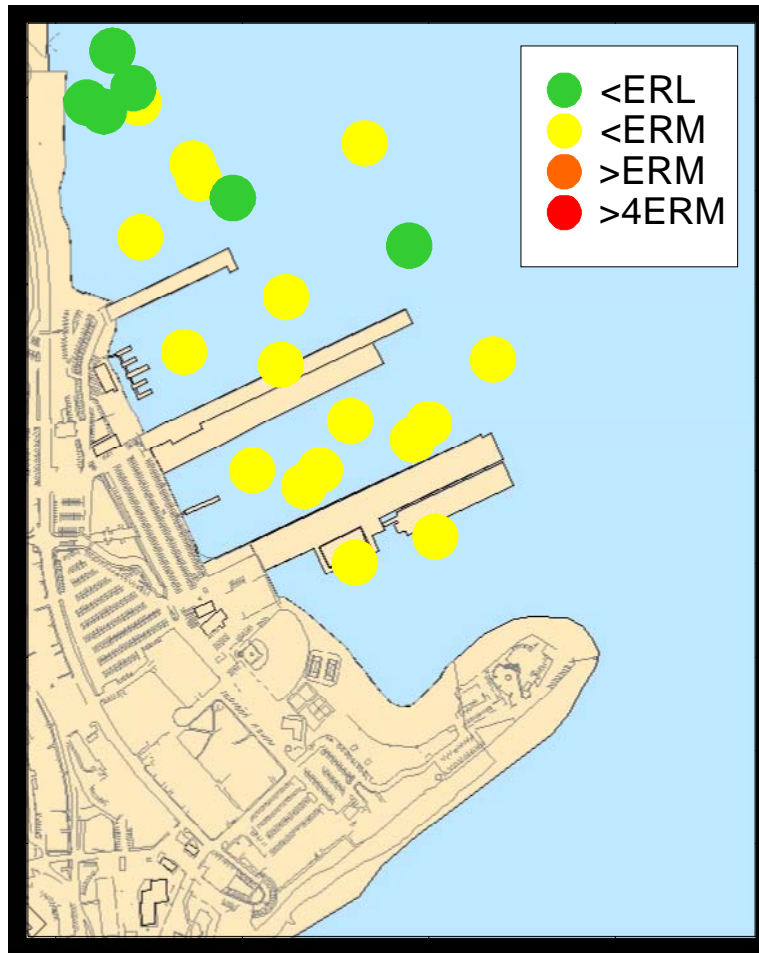
Historical Data Spatial Distribution

- Good coverage from Navy study (□) but limited chemistry with only metals and PAH
- Historical reference area to the North
- Most Bight 98 organic data (PAH, PCB, Pesticides) are non-detect

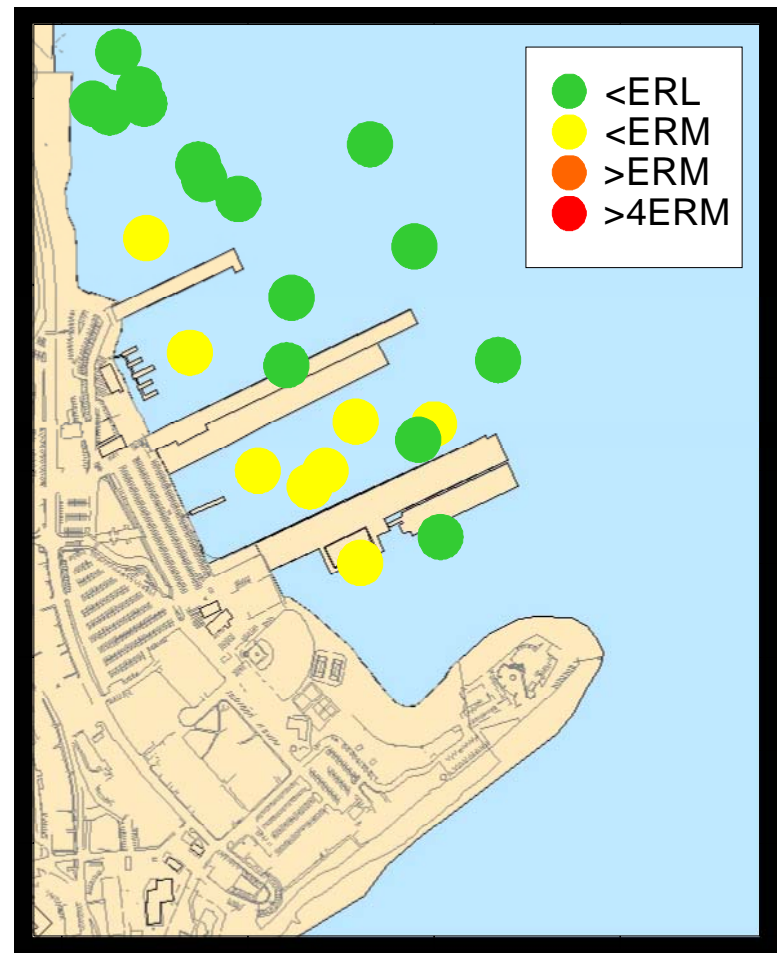


Historical Data

Copper

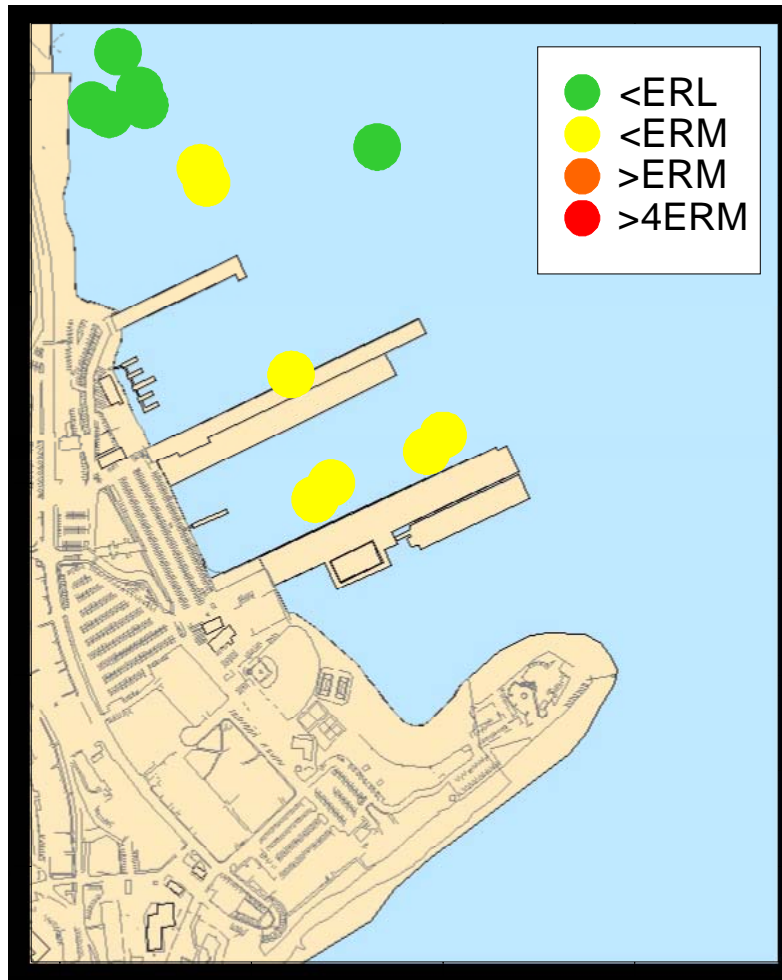


Zinc

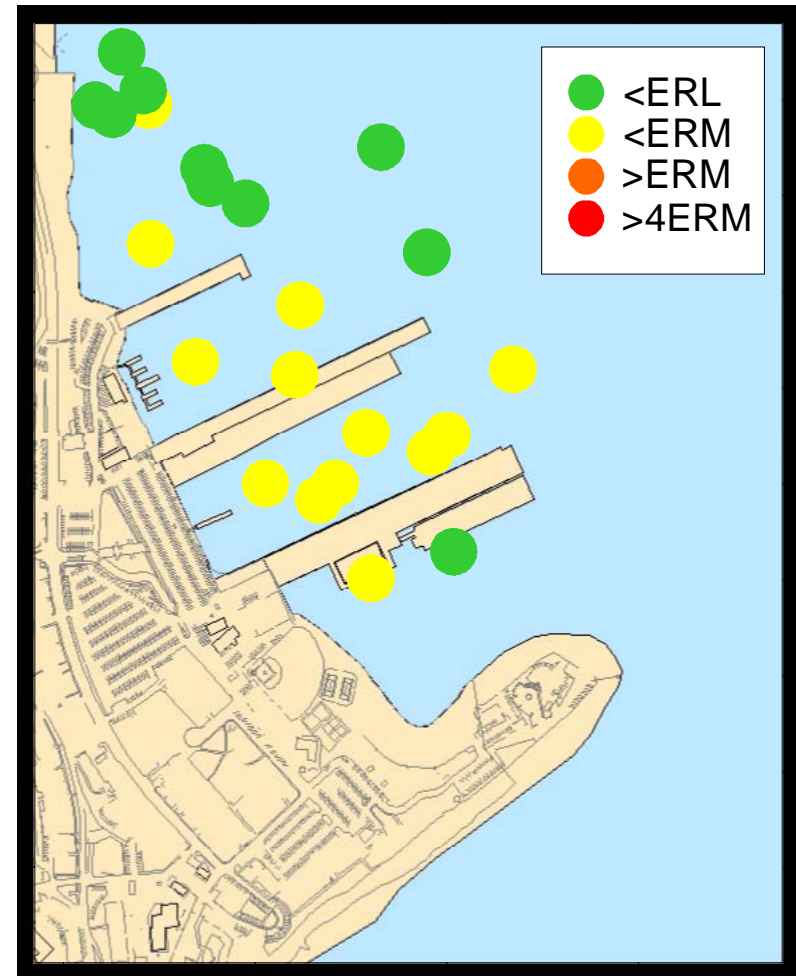


Historical Data

Total PCB



Total PAH



Determination of CoPCs

- Exceed conservative Effects Range Low (ERL) benchmark
- Exceed wildlife or human health screening level using:
 - maximum sediment concentration at site
 - estimated accumulation factors from Chollas/Paletta
 - screening level toxicity and cancer thresholds
- Insufficient historical data to evaluate (data gap)

	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn	PPAH	TPCB	TCHLOR	TDDT	TBT
<u>Aquatic Life</u>														
Total Stations	13	13	13	13	23	23	23	23	23	23	13	12	12	4
Below ERL	11	7	13	12	16	16	20	23	15	10	5	1	1	2
Above ERL	2 ^a	6	0	1 ^b	7	7	3	0	8	13	8	11	11	2 ^c
Above ERM	0	0	0	0	0	1	0	0	0	0	0	0	0	NA
<u>Wildlife</u>														
Least Tern HQ								X						
Sea Lion HQ		X		X										
<u>Human Health</u>														
HH HQ		X								X				
Insufficient Data														X
CoPC		X		X	X	X	X	X	X	X	X	X	X	X

a. ERL exceedences only for 2 ND Bight 98 stations with high detection limits

b. One value slightly exceeding ERL

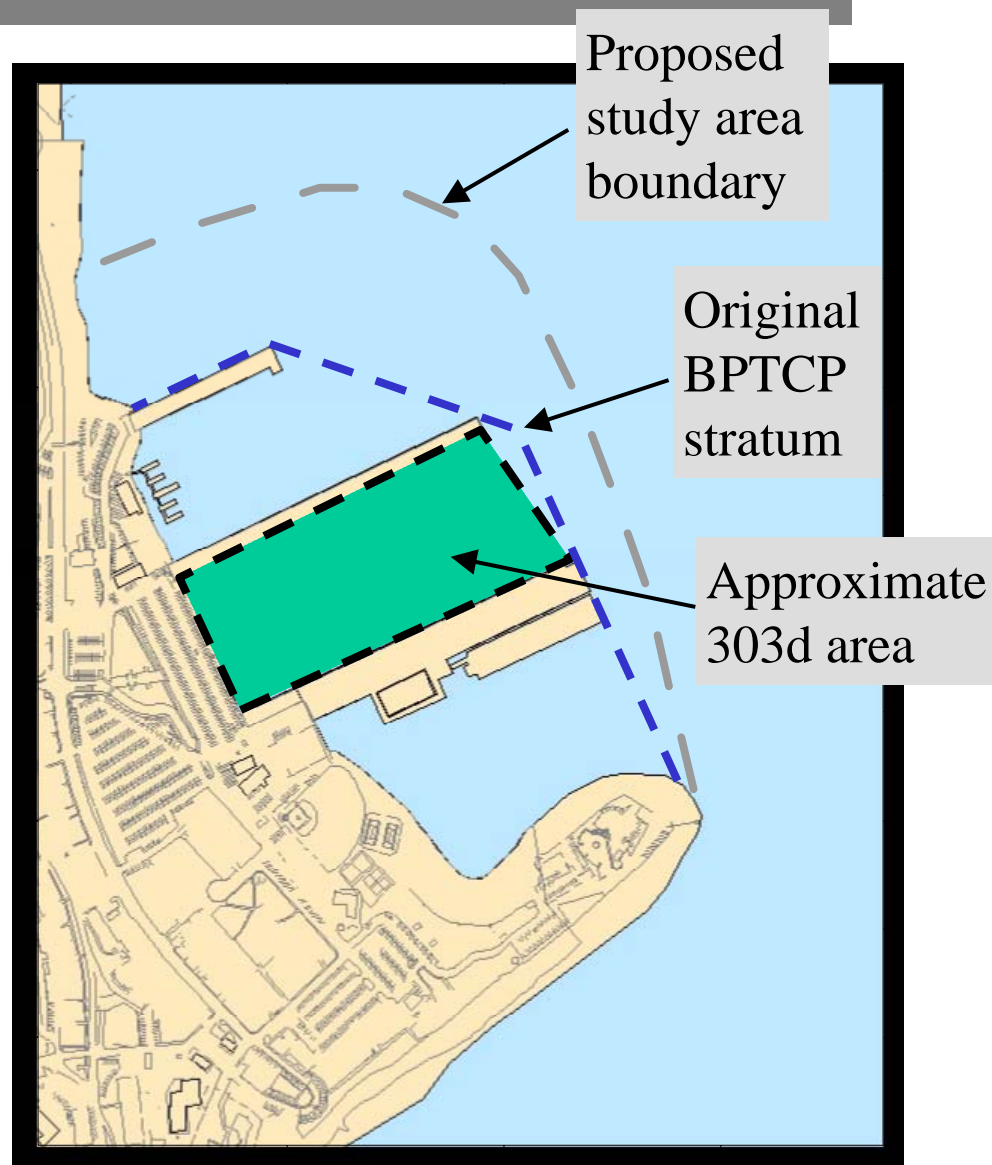
c. No ERL for TBT use screening value from EPA Region X (10 ug/kg)

Proposed CoPC List

- Metals – As, Cr, Cu, Hg, Ni, Pb, Zn
 - Ag and Cd included for validation
- Butyltin Species – TBT, DBT, MBT
- PAHs – 41 (parent and alkylated)
- PCBs – 41 congeners
- Pesticides – Chlordane, DDT, DDD, DDE

Study Area Boundary

- Study area define to:
 - Incorporate 303d listed area
 - Incorporate original BPTCP strata
 - Extend beyond any station exceeding ERL
- Contamination unlikely to reside east of boundary due to strong tidal currents



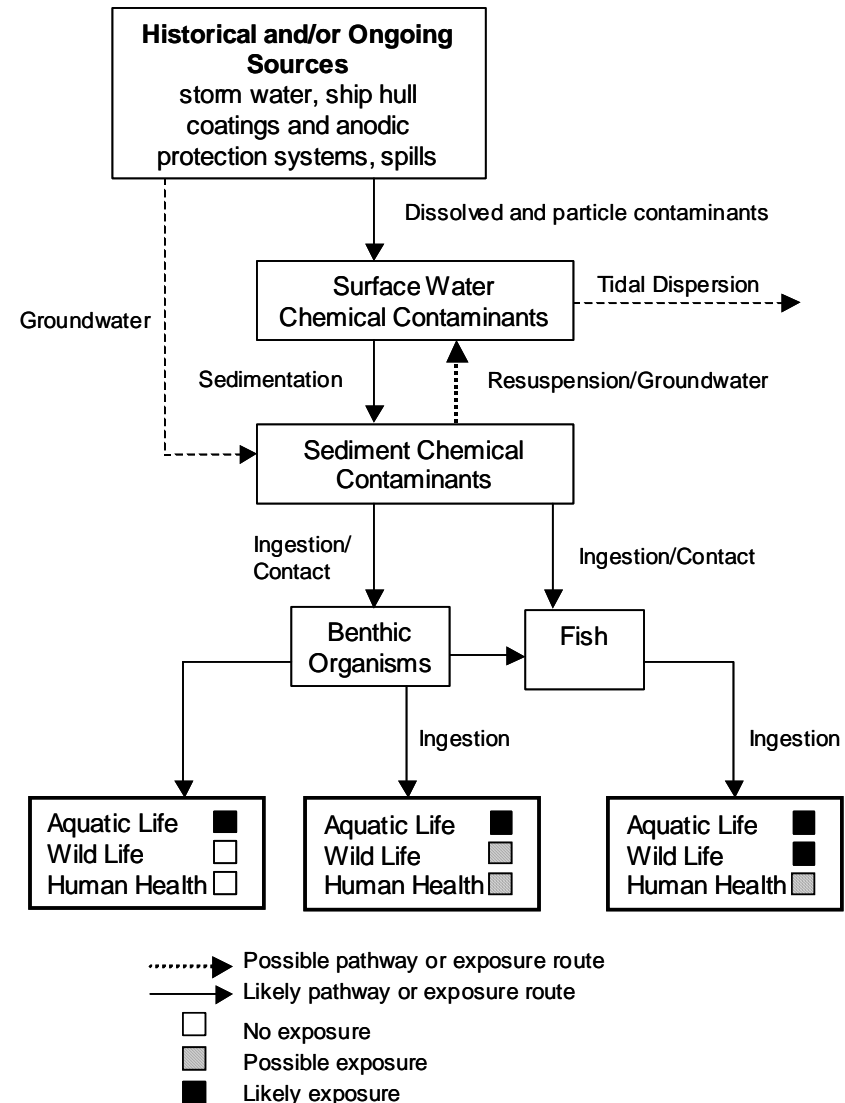


Technical Approach

- Conceptual Site Model
- Assessment Framework
- Spatial Sampling Design
- Reference Station Selection
- Data Analysis Framework

Site Conceptual Model

- Potential historical and ongoing sources
- Migration to sediment primarily via surface water
- Potential exposure pathways to aquatic life, wildlife, and humans



Assessment Framework

- Aquatic Life Assessment: Sediment triad analysis with weight-of-evidence
- Wildlife Assessment: Screening level risk assessment based on site-specific bioaccumulation in clams
- Human Health Assessment: Screening level risk assessment based on site-specific bioaccumulation in clams

Aquatic Life Assessment

Sediment Triad Approach

- ***Sediment chemistry:*** all CoPCs, organic carbon (TOC) and grain size
- ***Toxicity testing:*** for aquatic endpoints including
 - Amphipods exposed to solid phase sediments
 - Mussel larvae exposed to sediment water interface
 - Sea urchin or sand dollar larvae exposed to porewater
- ***Benthic community analysis:***
 - Abundance
 - Diversity
 - Benthic Response Index

Wildlife Assessment

Screening Level Risk Assessment

- ***Bioaccumulation:*** Evaluate clams exposed to site sediments
- ***Receptors:*** Assume clam tissue as source of food for wildlife receptors including:
 - Least Tern
 - Brown Pelican
 - Surf Scoter
 - Western Grebe
 - California Sea Lion
- ***Conservative assumptions:*** 100% dietary fraction, 100% area use factor, low toxicity reference value

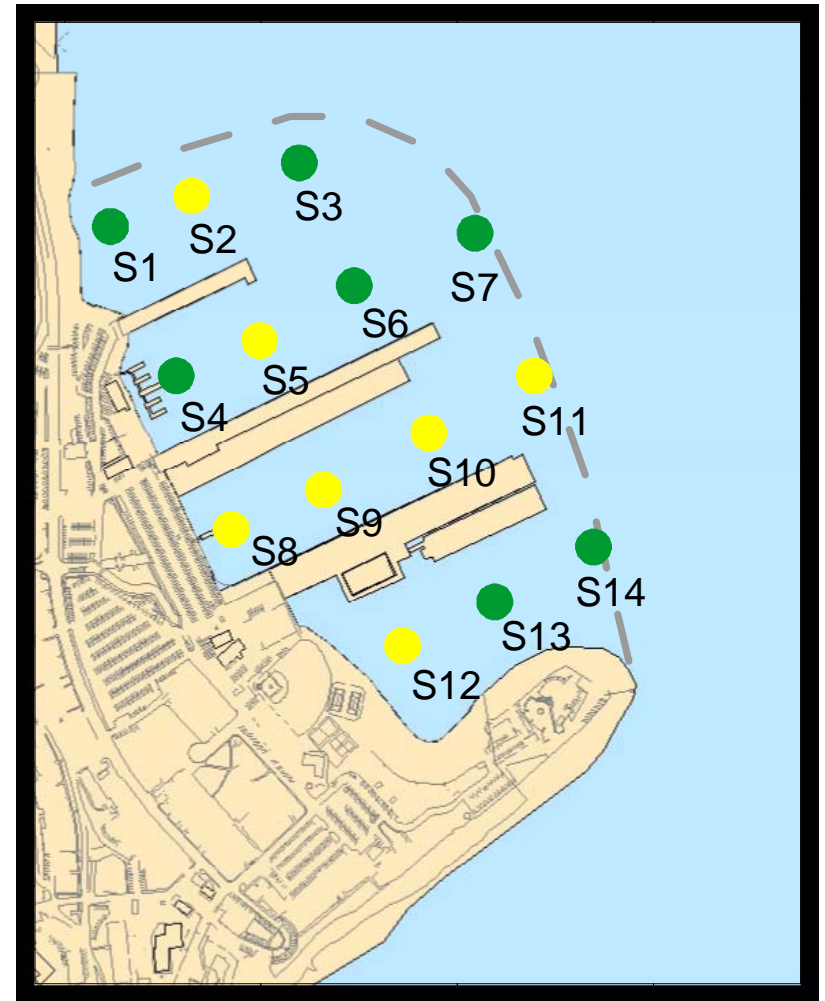
Human Health Assessment

Screening Level Risk Assessment

- ***Bioaccumulation:*** Evaluate clams exposed to site sediments
- ***Exposure:*** Assume clam tissue representative of all marine life harvested and consumed by humans at site
- ***Conservative Assumptions:***
 - 100% of seafood consumption from site
 - 100% assumed contaminated at 95% upper confidence limit
 - Conservative consumption rate
 - Conservative exposure duration

Site Sampling Design

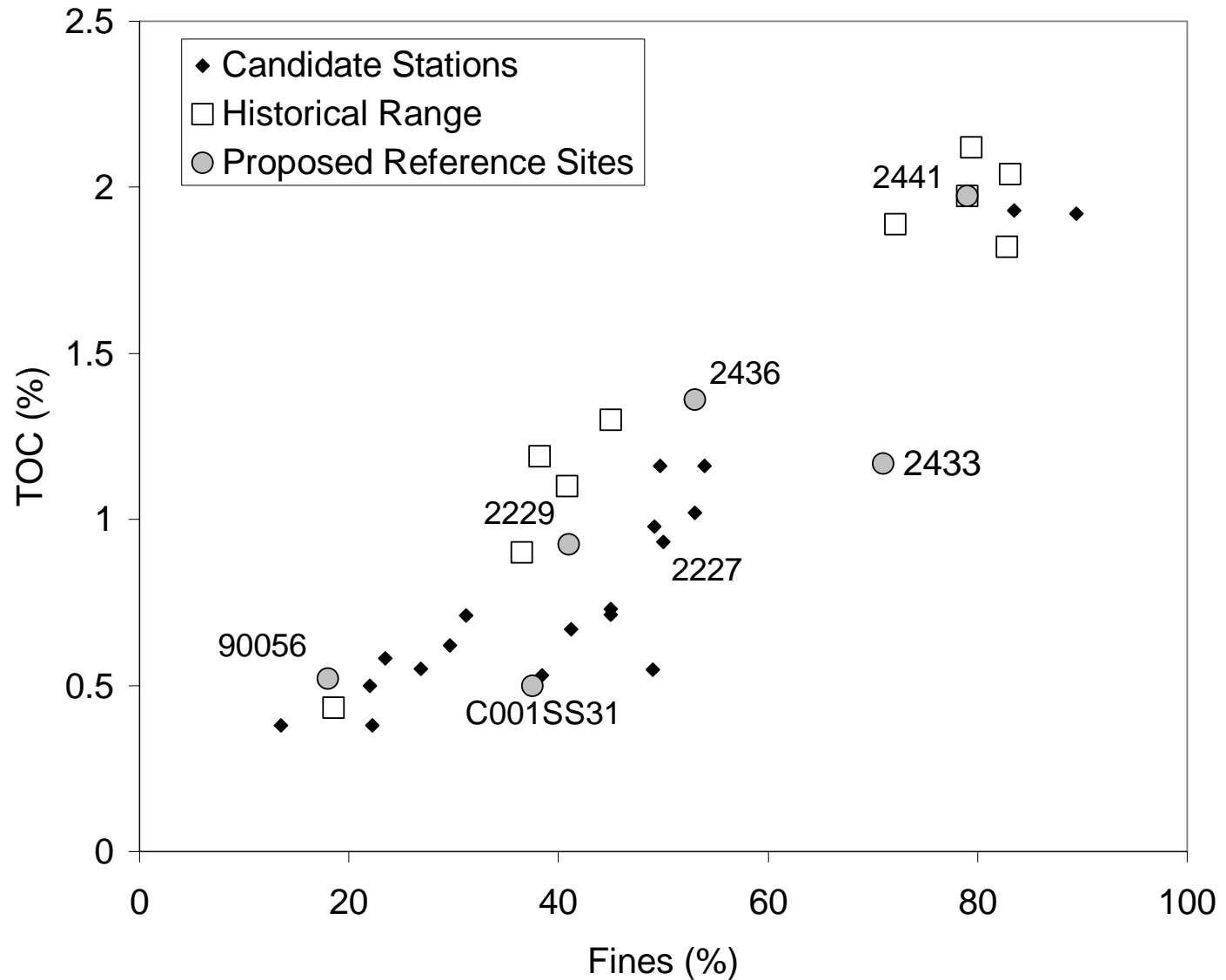
- Surface sediment (to 5 cm) at 14 site stations plus 6 reference
- Chemistry, toxicity and benthic community analysis at all stations (●)
- Above plus bioaccumulation at 7 site stations and 5 reference stations (●)



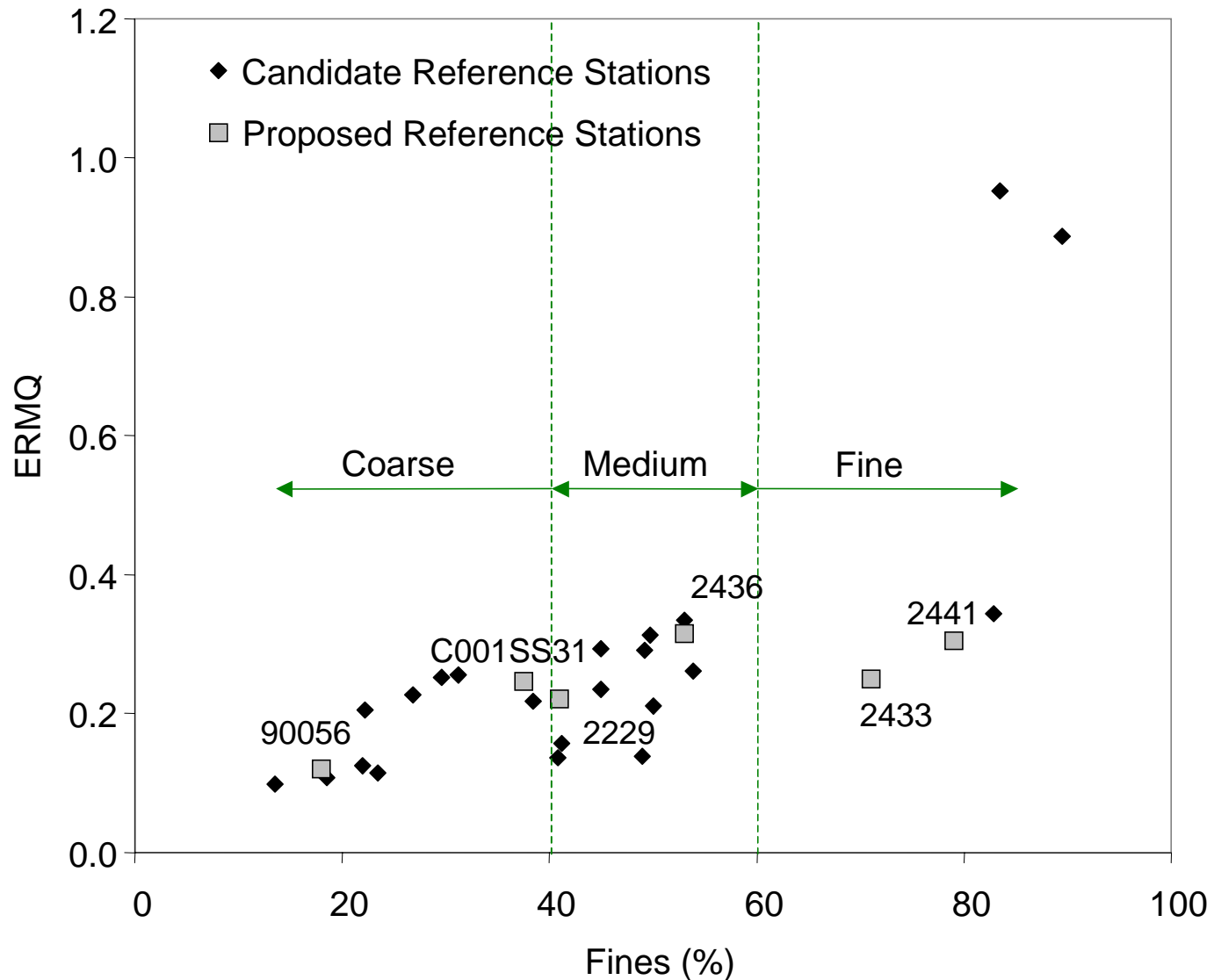
Reference Station Selection

- Stations selected from pool of historical data including Chollas/Paleta, Shipyard, Bight'98, BPTCP, NTC Boat Channel, and North Island studies.
- Selection Process:
 - Habitat: Use only stations from outer bay (~west of downtown) to maintain common benthic habitat
 - Source Areas: Filtered to remove stations within marinas, enclosed side-basins
 - Aquatic Life: Filtered on amphipod survival >80%
 - Final: Of remaining stations, select stations spanning site TOC and fines with low chemistry and undegraded benthic community conditions

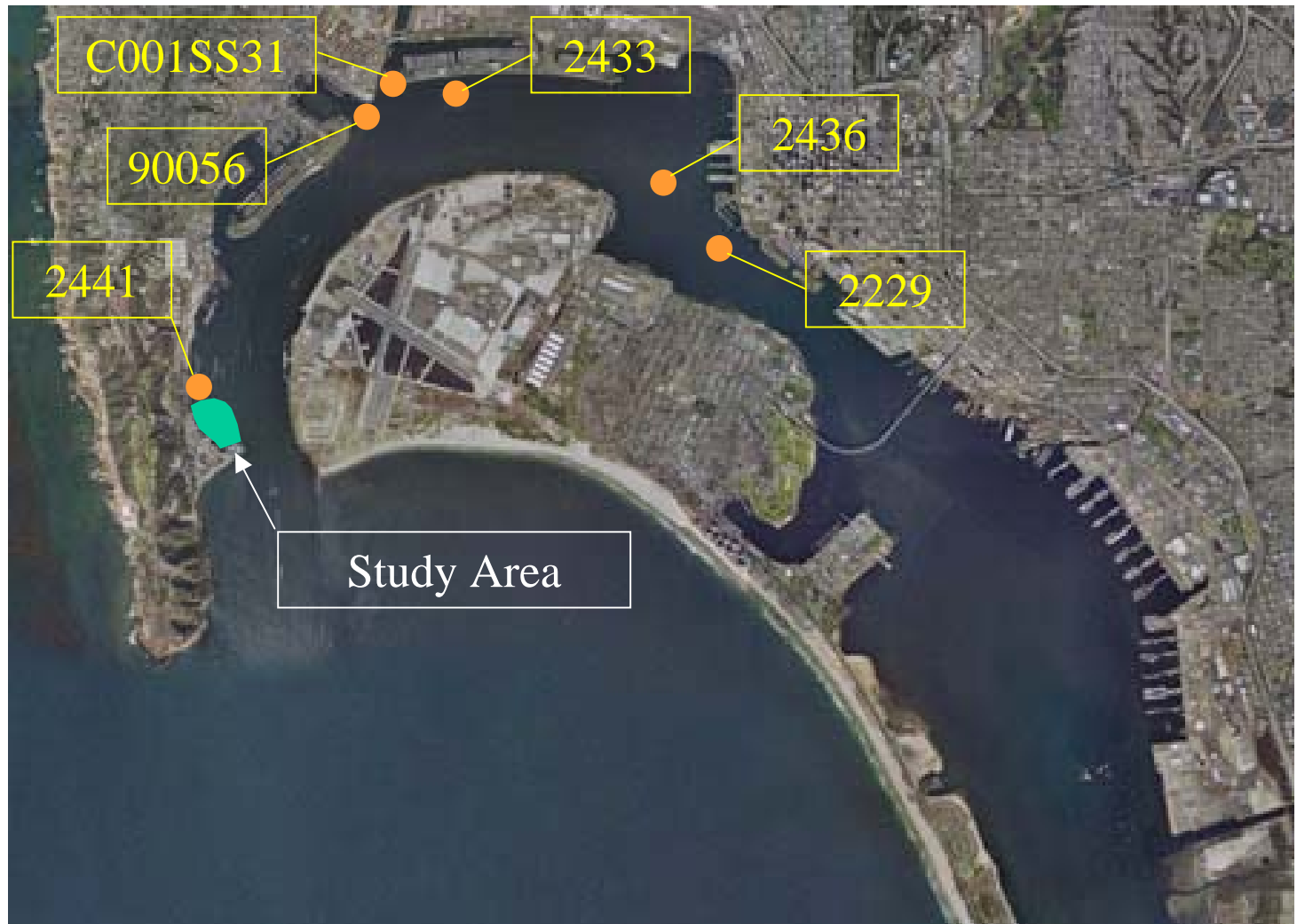
Reference Station Selection



Reference Station Selection



Proposed Reference Station Locations



Reference Station Characteristics

- Expected characteristics of reference stations
- Conditions to be validated by reconnaissance sampling
- Final reference conditions to be based on samples collected synoptically with site samples

Study	StationID	Physical Prop.		Metals								
		FINES (%)	TOC (%)	Ag (mg/kg)	As (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Zn (mg/kg)
BPTCP	90056	18	0.52	0.12	3.2	0.19	37.0	19.0	0.09	7.0	21.7	65
NTC	C001SS31	37.5	0.5	0.35	3	0.06	20.1	40.2	0.2	5.3	16.1	78
Bight 98	2229	41	0.92	0.41	5.4	0.09	31.6	58.9	0.32	9.3	24.5	99
Bight 98	2436	53	1.36	0.62	8.6	0.21	48.4	85.8	0.52	15.3	34.4	145
Bight 98	2433	71	1.17	0.50	8.3	0.25	34.5	71.6	0.26	14.9	21.0	126
Bight 98	2441	79	1.97	1.50	12.4	0.25	43.9	71.8	0.19	16.6	21.9	123

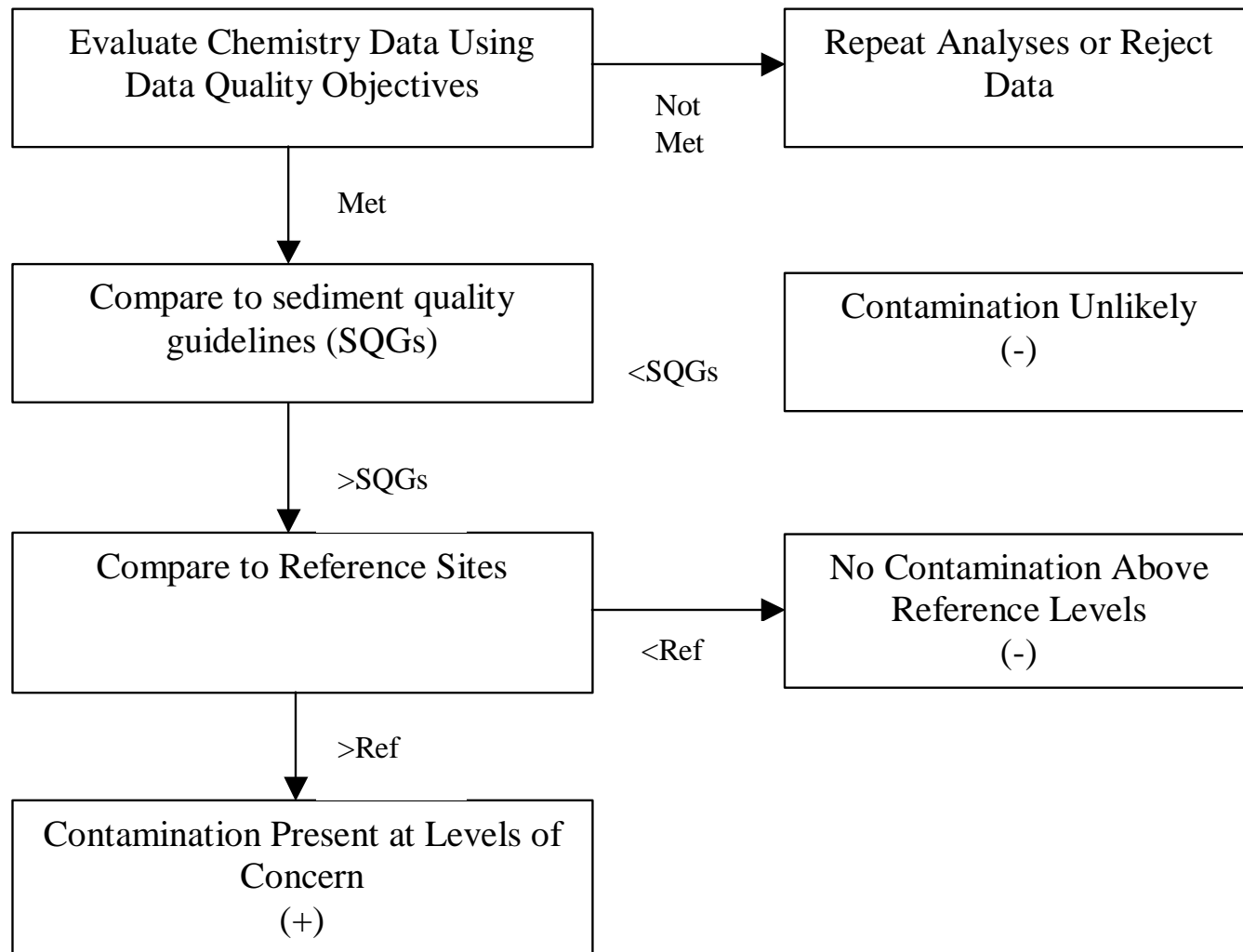
Study	StationID	Organics				Summary	Tox	Benthic Community			
		PPPAHs (ug/kg)	TPCBs (ug/kg)	Tchlor (ug/kg)	TDDTs (ug/kg)	ERMQ	Am. Surv. (%)	Abund.	# Taxa	S-W	BRI
BPTCP	90056	300	11.7	0.50	2.90	0.12	87	na	na	na	na
NTC	C001SS31	593	15.05	5	21.5	0.25	88	na	na	na	na
Bight 98	2229	1339	50.5	0.60	1.67	0.22	94	705	63	3.12	15.7
Bight 98	2436	565	50.5	0.60	1.67	0.32	96	599	48	3.06	19.4
Bight 98	2433	574	50.5	0.60	1.67	0.25	93	709	59	3.08	21.0
Bight 98	2441	1445	50.5	0.60	1.67	0.30	87	1672	86	3.23	17.2

Data Analysis Framework

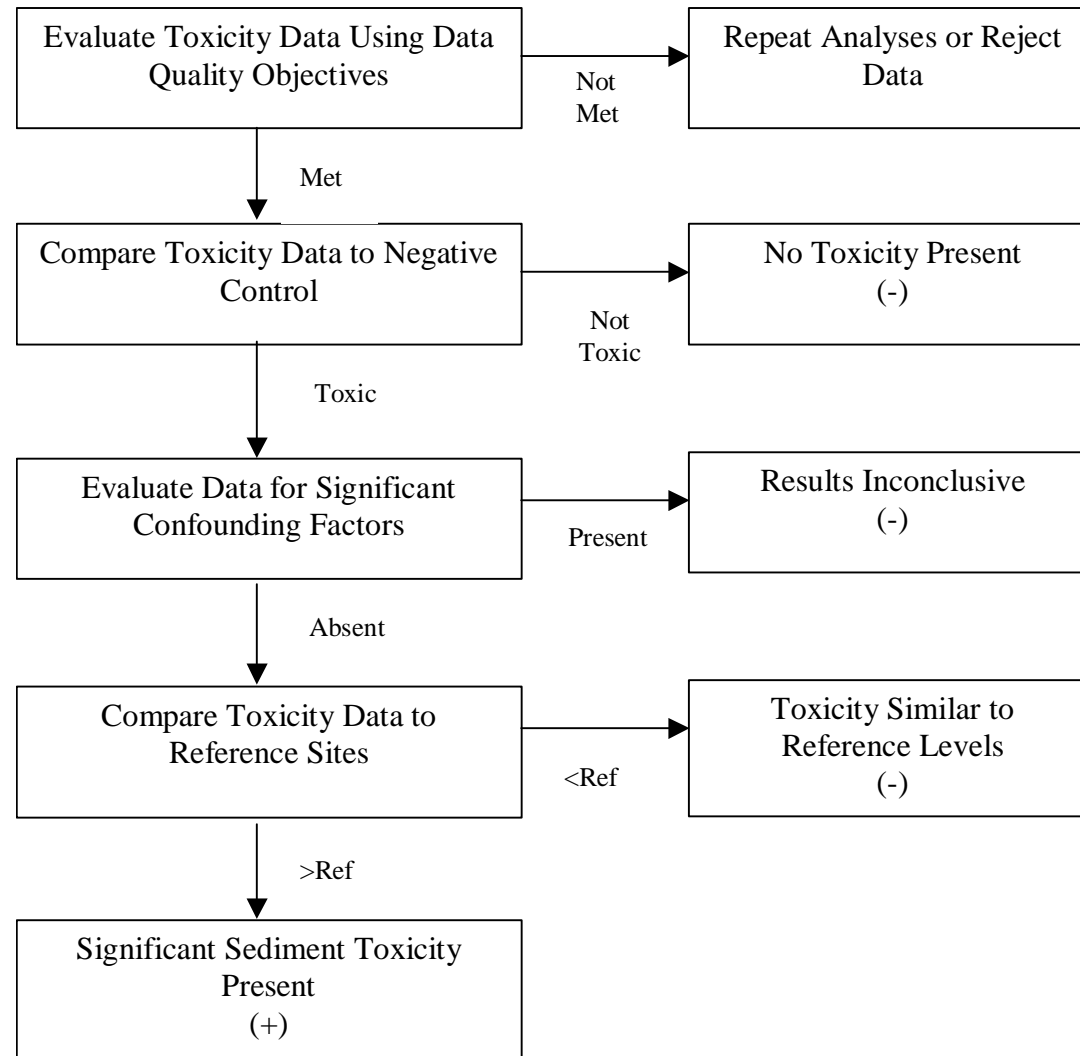
Analysis Components

- Aquatic Life Impairment
 - Comparison to sediment quality guidelines (SQG)
 - Comparison to reference
- Wildlife Impairment
 - Comparison to toxicity reference values
 - Comparison to reference
- Human Health Impairment
 - Comparison to toxicity and cancer thresholds
 - Comparison to reference
- Weight of Evidence Analysis

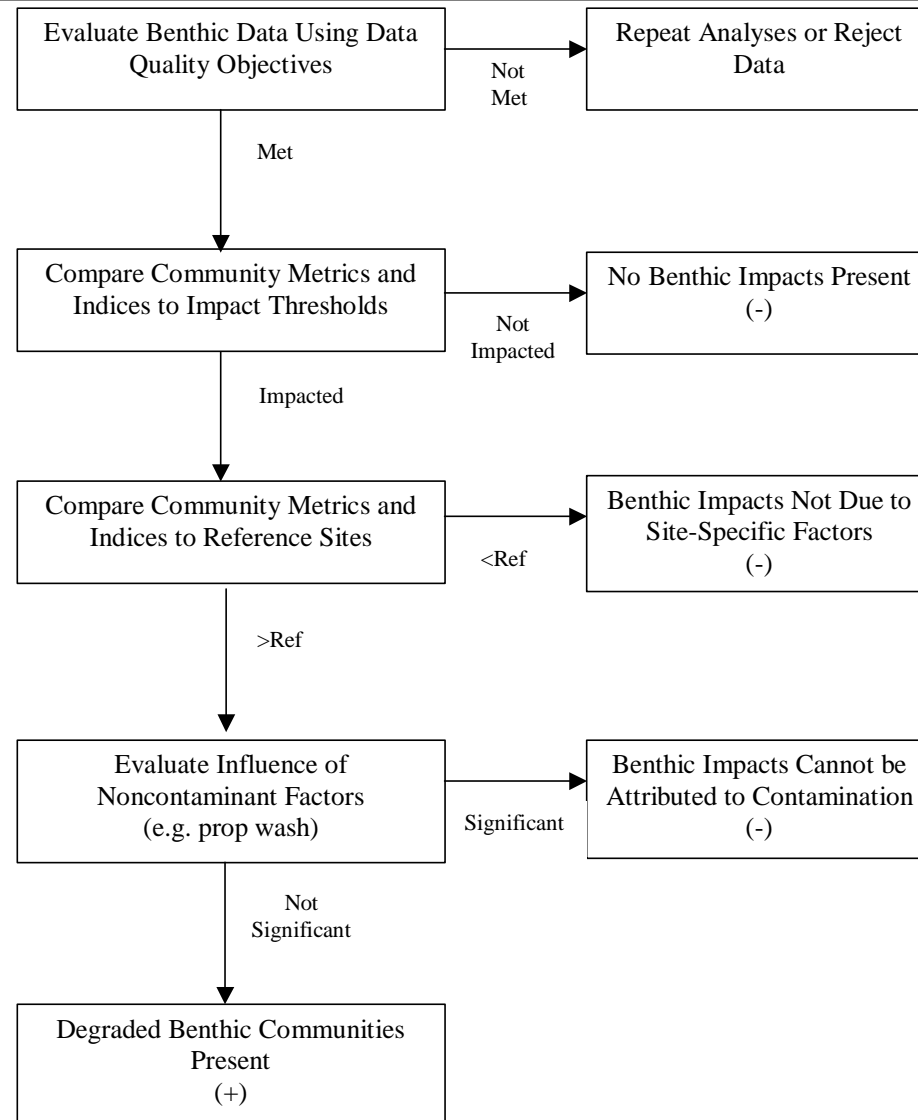
Aquatic Life - Chemistry



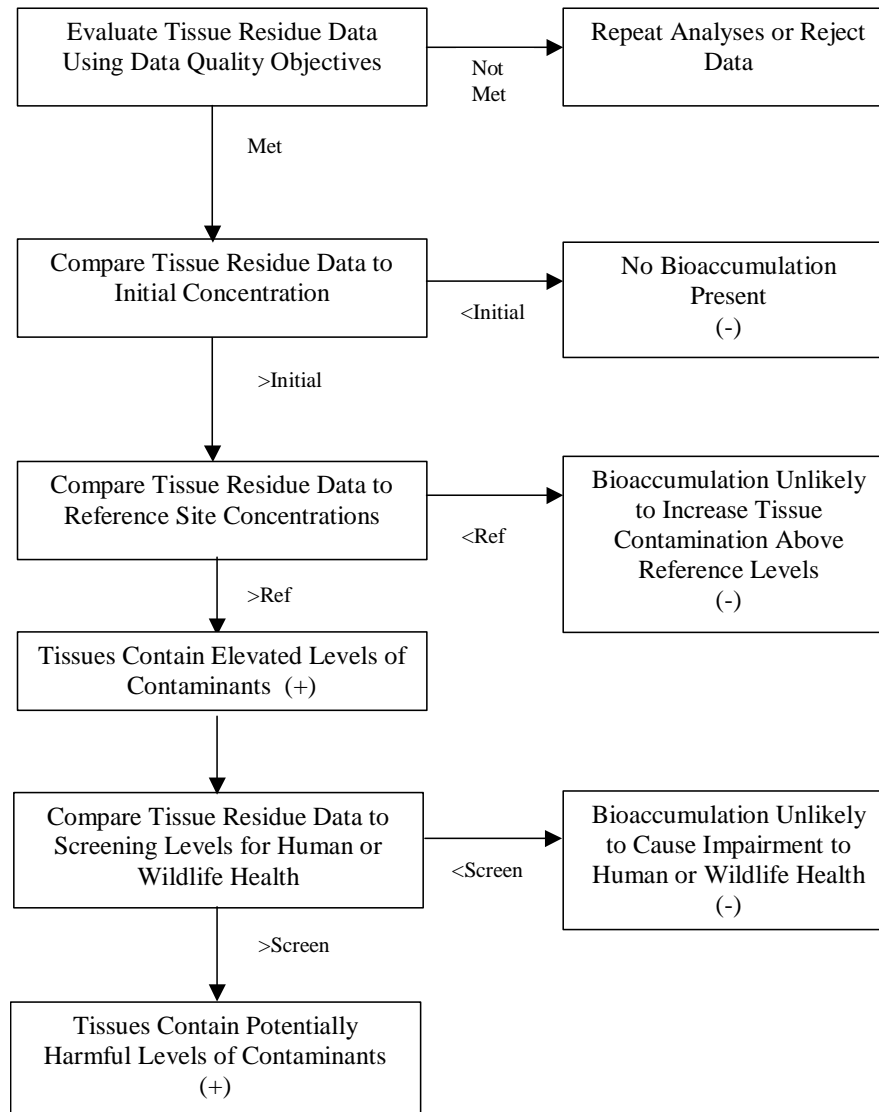
Aquatic Life - Toxicity



Aquatic Life - Benthic Community



Wildlife and Human Health Analysis



Weight of Evidence Analysis

- Evaluate all lines of evidence to determine most appropriate action
- Potential phase II/III studies to refine/validate findings
- Potential removal of unimpaired areas from further study

Sediment Contam.	Toxicity	Degraded Benthos	Bioaccumulation	Beneficial Use Impairment		Recommended Action
				Aquatic Life	Human/Wildlife	
+	+	+	+	Highly Likely	Possible	Phase II studies Phase III studies Refine health assessment
+	+	+	-	Highly Likely	Unlikely	Phase II studies Phase III studies
+	-	+	-	Likely	Unlikely	Possible Phase II studies Possible Phase III studies
+	+	-	-	Likely	Unlikely	
+	-	+	+	Likely	Possible	Possible Phase II studies Possible Phase III studies
+	+	-	+	Likely	Possible	Refine health assessment
-	+	+	+	Likely	Possible	Possible Phase II studies
-	+	-	+	Possible	Possible	Evaluate confounding factors
-	-	+	+	Possible	Possible	Refine health assessment Refine exposure pathways
+	-	-	+	Unlikely	Possible	Refine health assessment
-	-	-	+	Unlikely	Possible	Refine exposure pathways
-	+	+	-	Possible	Highly Unlikely	Possible Phase II studies
-	+	-	-	Unlikely	Highly Unlikely	Evaluate Confounding Factors
-	-	+	-	Unlikely	Highly Unlikely	
+	-	-	-	Unlikely	Unlikely	
-	-	-	-	Highly Unlikely	Highly Unlikely	No Further Action

Phase I Schedule

Task	Initiation	Completion
Sampling & Analysis Plan	July 2003	Nov 2003
Field Sampling Program	Dec 2003	Feb 2004
Sample Analysis	Dec 2003	Apr 2004
Data Analysis	Mar 2004	July 2004
Draft Phase I Report	June 2004	Sept 2004

Summary

- Incorporate public and agency input to study plan
- Initiate Phase I sediment impairment study at Subase San Diego
- Assess potential aquatic life, wildlife and human health impacts
- Evaluate weight of evidence and make appropriate recommendations for future action



Questions?